

Relationship of *Cryptococcus neoformans* to Pigeons in Milwaukee, Wisconsin

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DURING A SEARCH for *Blastomyces dermatitidis* and other human pathogenic fungi in pigeon excreta, information was obtained on the prevalence and dispersal of *Cryptococcus neoformans* in the Milwaukee, Wis., region.

Since the demonstration by Emmons (1) of the close association between pigeon droppings and *C. neoformans*, results of numerous studies on the isolation of *C. neoformans* from this substratum have been published. *B. dermatitidis*, however, has not been isolated from pigeon excreta. On the other hand, to our knowledge, the intravenous mouse isolation technique has not been used to assay materials from pigeon habitats in a large-scale investigation.

The investigation reported here seemed justified because the intravenous mouse isolation technique was used to assay numerous samples collected in or near a large city which is located in an area where *B. dermatitidis* is known to be endemic (2, 3). Furthermore, many patients

with North American blastomycosis stated in interviews that they had had close contact with pigeon excreta, and some of these patients believed that they had contracted the disease by inhaling material from pigeon droppings.

Materials and Methods

Pigeon droppings, soil, and other materials were collected and assayed for the presence of pathogenic fungi by direct and indirect procedures (4).

Each mouse was inoculated intravenously and intraperitoneally with suspensions of the materials collected. Portions of the suspensions were also plated on brain-heart-infusion dextrose agar with 1 percent human blood, 20 units of penicillin, and 40 units of streptomycin per milliliter as well as on liver-spleen glucose agar (Difco) plus the antibiotics. The liver-spleen agar is a dehydrated medium but otherwise similar to the liver-spleen medium formulated by Littman (5) which, with the addition of blood, was used successfully in isolating *C. neoformans* from pigeon excreta in New York City (6).

The habitats from which samples were collected (shown in the table) were widely scattered throughout the city of Milwaukee and its environs. Because the main objective of this investigation was the isolation of *B. dermatitidis*, only one attempt was made to collect samples solely because they were thought to contain *C. neoformans*.

Thus, pigeon excreta was collected wherever it

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was found in quantity. Fresh droppings were not avoided despite the earlier demonstration by Emmons (1) that *C. neoformans* was isolated more frequently from old fecal material and despite the report by Staib (7) that in a suspension of *C. neoformans* in fresh pigeon manure the yeast was no longer demonstrable after 6 days.

Results

B. dermatitidis was not isolated from any of the pigeon habitats studied. Of 183 samples assayed, 3 yielded *Allescheria boydii* and 50 yielded *C. neoformans*. All of the *C. neoformans* strains reproduced only by budding, grew well at both 25° C. and 37° C., produced capsules, and did not grow on agar containing 0.5 mg. of cycloheximide per ml. of medium. All strains produced urease. All strains isolated by the intravenous-intraperitoneal method were pathogenic to mice when inoculated intracerebrally with 0.02–0.03 ml. of a suspension of a 4- to 5-day old culture. Each strain was tested on two mice. All but a few strains killed at least one of the mice within 3 weeks after inoculation. In all cases, mice not dead at the end of 3 weeks were sacrificed and their heads were opened. The yeast was observed to have produced large capsules, to have invaded the brain, and to be budding abundantly.

During the early part of the investigation liver-spleen agar was not used. Of the samples assayed by mouse inoculation and plating on both brain-heart-infusion agar plus blood- and liver-spleen agar, 96 percent of the 23 samples that yielded *C. neoformans* were positive for this fungus by mouse inoculation, 26 percent by plating on liver-spleen agar, and 8.7 percent on brain-heart-infusion agar. In only one case the yeast was isolated by plating but not by the mouse inoculation method. All samples that yielded *C. neoformans* upon direct plating on brain-heart-infusion agar also yielded the yeast upon direct plating on the liver-spleen medium. Thus the intravenous-intraperitoneal mouse inoculating method was found to be far superior to the plating methods.

A slight modification used in the preparation of suspensions for mouse inoculation yielded a larger number of samples positive for *C. neo-*

formans. In the new method, the fecal material was suspended in sterile 0.85 percent sodium chloride solution containing antibiotics, crushed as much as possible with a stirring rod, and allowed to settle for 30 minutes as had been done previously. However, at this point rather than inoculating into mice material taken from the interphase between the supernatant and the

Pigeon droppings and soil positive for *Cryptococcus neoformans*, by location of pigeon habitats from which samples were collected

Habitat	Number samples collected	Number samples positive
<i>Sheltered</i>		
Steeple or tower, open to pigeons:		
Droppings on floor, thick layer:		
Fresh and old	12	0
Droppings on floor, thin layer:		
Mostly old	21	11
Fresh and old	6	0
Mostly fresh	3	0
Droppings in nest:		
Nest in use	6	0
Nest not in use	1	0
Droppings on stairsteps:		
Mostly old	6	2
Mostly fresh	6	0
Droppings on windowsill, inside:		
Fresh and old	1	0
Steeple or tower, boarded up for 2 years: Powdery droppings, thick layer	13	0
Second-story porch, open only to south: Mostly old droppings, pigeon and starling	6	4
Window ledges, outside:		
Fresh and old droppings	6	0
Pigeon nests, in use	4	0
Loft of pigeon fancier:		
Mostly old droppings on floor	3	2
Pigeon nest, in use	1	0
Pigeon nest, not in use	1	1
Industrial plants, droppings on floors, thin layer:		
Fresh and old	5	1
Fresh	0	0
<i>In the open</i>		
On building, droppings in thin layer: New and old	2	0
Lagoon shore, bird feeding area: Soil and droppings	7	0
Small city park: Soil and droppings	8	0
Sidewalk, droppings adherent: Fresh and old droppings	1	0
Sidewalk, sweepings: Mostly old feces dislodged from a building	58	29
Under railroad overpass: Soil and droppings	6	0
Total	183	50

sediment, the sediment was further macerated by crushing and stirring. It was then allowed to settle out again for 30 minutes before the inoculum was removed. This method was especially useful in assaying tough, rain-washed droppings that had been collected from sidewalks in springtime. In one experiment only 1 of 12 such samples yielded *C. neoformans* by the old method while 5 of the same 12 samples were found to be positive by the "2-soak-method."

As shown in the table, of the 183 samples tested approximately 28 percent yielded *C. neoformans*. As would be expected, a much larger percentage (46 percent) of samples of exclusively old pigeon droppings was positive.

An interesting discovery was the finding of three positive samples of pigeon droppings at an elevation of 281 feet, on the floor of a round tower of a large public building, in the center of the city. Hasenclever and Emmons (8) reported collecting positive samples at an elevation of 140–150 feet.

The most interesting discovery, however, was evidence for the active dispersal of *C. neoformans* into the air by pigeons. The large, old building is several stories high, and it has recessed windows with ledges that provide good nesting sites for pigeons. Many of the windows are not used and are covered up on the inside so that the window ledges cannot be cleaned except from a ladder. An overhanging roof protects ornamental ridges on which the pigeons perch. The building extends from east to west near the center of the city and some distance back from the busy front sidewalk. The east and west walks touch the building.

This building was recently cleaned completely, but during the course of the investigation the east and west walks were swept each morning to remove the feces dislodged from the ledges and ridges by birds. Each year, over a 3-year period, samples were taken from the sweepings and assayed for the presence of pathogenic fungi. *C. neoformans* was isolated regularly from the droppings, as shown below.

Date	Number samples tested	Number samples positive
October and November 1962...	22	7
April 1963.....	12	7
August and September 1964....	24	15
Total.....	58	29

Discussion

The results of this study indicate that *C. neoformans* is widely distributed in and around the city of Milwaukee in pigeon manure and that, with adequate sampling, it can be isolated from almost all nesting places of any size. Whether or not it can be found in dried manure from old boarded-up nesting places was not determined conclusively. However, 13 samples of completely dry, powdery pigeon manure taken from a steeple that had been boarded up for 2 years did not yield *C. neoformans*. It was not known whether the fungus was there before the steeple was sealed. Many investigators have reported that the fungus withstands desiccation very well. Staib (9) has reported its persistence in sun-dried sand for 1½ years.

The regular isolation of *C. neoformans* over a 3-year period from pigeon droppings collected from sidewalk sweepings seems to indicate active dispersal of the fungus into the air. Emmons (10) estimated that each gram of dry fecal material from pigeons taken from a sidewalk under a fire escape in Washington, D.C., contained 50 million viable *C. neoformans* cells. The pigeon manure in the walk sweepings from Milwaukee quite likely contained enormous numbers of the pathogen also, and it is hardly conceivable that such fecal material could be dropped without liberating large numbers of cells into the air.

It is therefore reasonable to conclude that many buildings in a city of the size of Milwaukee may act as reservoirs for pollution of the air with this pathogenic yeast. The recent isolation of the fungus from air (11) lends further credence to the theory that *C. neoformans* may be a rather common constituent of the air near pigeon habitats.

While the results of this investigation suggest the existence of a continuously potential danger, the public health significance of pollution of the air with *C. neoformans* has yet to be fully determined. A preliminary survey indicates that cryptococcosis is diagnosed in Milwaukee at a rate similar to that reported by Schneidau (12) for New York City, slightly less than 2 cases per year per million inhabitants. This apparently low incidence might be thought to be due to the scarcity of highly pathogenic cells of the yeast as it exists in

nature, the degree of exposure of people to the pathogen, and the resistance of the host or a failure to detect some cases of the disease, or both (especially benign, spontaneously healing infections).

Hasenclever and Emmons (13) demonstrated that almost one-half of 47 *C. neoformans* strains that they had isolated from nature, demonstrated a virulence within the range shown by 21 strains isolated from human disease. Although our work was done with mice, there is no known reason why it may not indicate that a large proportion of the yeast cells in nature are pathogenic to man. The recent report (14) of a case of pulmonary cryptococcosis acquired by inhalation of yeast cells from pigeon excreta in Chicago supports the concept that the fungus, as it exists in pigeon droppings, can be pathogenic to man.

There is evidence, however, that the degree of exposure of people to *C. neoformans* may be an important factor. While mice have been infected by intranasal inoculation, the most successful experiments have used an inoculum consisting of a rather large number of cells, 11,000 to 14,622 (15). In the Chicago case of human pulmonary disease the patient had repeatedly trapped wild pigeons in an abandoned building where he was exposed to the pathogen. Thus it may be that usually a large number of cells must enter the lungs in order for pulmonary disease to be established in a healthy person.

Whether or not asymptomatic or mild cases of cryptococcosis exist in significant numbers has yet to be established, although this possibility was recognized in 1955 (1). As yet, however, it seems that no *C. neoformans* antigen has been shown to be specific enough to be used in skin-test or serologic studies which would establish the frequency with which benign, spontaneously healing infections occur (16). Such infections could possibly result from dispersal of *C. neoformans* cells from pigeon habitats such as described here.

Summary

In a longitudinal study in and around the city of Milwaukee, pigeon excreta and soil containing pigeon droppings were assayed for the

presence of animal or human pathogenic fungi. *Cryptococcus neoformans* was isolated by intravenous and intraperitoneal mouse inoculation and by direct culture on laboratory media. The yeast was found to exist in almost all old nesting places of all sizes examined.

Over a 3-year period, *C. neoformans* was isolated regularly from dried pigeon droppings dislodged by birds from roosting places on a large building and collected as sidewalk sweepings. This was considered indicative of active dispersal of the fungus into the air.

REFERENCES

- (1) Emmons, C. W.: Saprophytic sources of *Cryptococcus neoformans* associated with the pigeon (*Columba livia*). *Amer J Hyg* 62: 227-232 (1955).
- (2) Cherniss, E. I., and Waisbren, B. A.: North American blastomycosis: a clinical study of 40 cases. *Ann Intern Med* 44: 105-123 (1956).
- (3) McDonough, E. S.: Epidemiology of 46 Wisconsin cases of North American blastomycosis. *Mycopathologia*. In press.
- (4) McDonough, E. S., Van Prooien, R., and Lewis, A. L.: Lysis of *Blastomyces dermatitidis* yeast-phase cells in natural soil. *Amer J Epidem* 81: 86-94 (1965).
- (5) Littman, M. L.: Liver-spleen glucose blood agar for *Histoplasma capsulatum* and other fungi. *Amer J Clin Path* 25: 1148-1159 (1959).
- (6) Littman, M. L., and Schneierson, S. S.: *Cryptococcus neoformans* in pigeon excreta in New York City. *Amer J Hyg* 69: 49-59 (1959).
- (7) Staib, F.: Vogelkot, ein Nährsubstrat für die Gattung *Cryptococcus*. *Zbl Bakt [Orig]* 186: 233-247 (1962).
- (8) Hasenclever, H. F., and Emmons, C. W.: The prevalence and mouse virulence of *Cryptococcus neoformans* strains isolated from urban areas. *Amer J Hyg* 78: 227-231 (1963).
- (9) Staib, F.: Zur Widerstandsfähigkeit von *Cryptococcus neoformans* gegen Austrocknung und hohe Temperaturen. *Arch Microbiol* 44: 323-333 (1963).
- (10) Emmons, C. W.: Natural occurrence of opportunistic fungi. *Lab Invest* 11: 1026-1032 (1962).
- (11) Shields, A. B., and Ajello, L.: Medium for selective isolation of *Cryptococcus neoformans*. *Science* 151: 208 (1966).
- (12) Schneidau, J. D.: Pigeons and cryptococcosis. *Science* 143: 525-526 (1964).
- (13) Hasenclever, H. F., and Emmons, C. W.: The prevalence and mouse virulence of *Cryptococcus neoformans* strains isolated from urban areas. *Amer J Hyg* 78: 227-231 (1963).

- (14) Procknow, J. J., Benfield, J. R., Rippon, J. W., Diener, C. F., and Archer, F. L.: Cryptococcal hepatitis presenting as a surgical emergency. *JAMA* 191: 269-274 (1965).
- (15) Smith, C. D., Ritter, R., Larsh, H. W., and Furcolow, M. L.: Infection of white Swiss mice with airborne *Cryptococcus neoformans*. *J Bact* 87: 1364-1368 (1964).
- (16) Campbell, C. C.: Problems associated with antigenic analysis of *Histoplasma capsulatum* and other mycotic agents. *Amer Rev Resp Dis* 92: 113-118 (1965).

Accreditation of Rehabilitation Facilities

A national Commission on Accreditation of Rehabilitation Facilities has been created by the Association of Rehabilitation Centers and the National Association of Sheltered Workshops and Homebound Programs. Its objective is to advance standards in rehabilitating the handicapped.

The plan of this new accrediting body has been endorsed by Miss Mary E. Switzer, Commissioner of the Vocational Rehabilitation Administration, U.S. Department of Health, Education, and Welfare. "VRA," she said, "desires to definitely and positively encourage accreditation of workshops and rehabilitation facilities by a competent voluntary organization. . . . When accreditation becomes a reality, VRA will encourage State rehabilitation agencies to use accredited facilities just as we urge them now to use accredited hospitals."

A 1962 survey by ARC showed at least 2,000 facilities were then engaged in rehabilitation activity. Many of these programs still are substandard in terms of personnel, operational methods, and physical facilities. This situation exists primarily because of a lack of well-formulated and tested standards for rehabilitation center and workshop operations.

The commission's purpose is to foster improvement and development of uniformly high standards of performance—consistent with the purposes of the two founding organizations—at all facilities for treating handicapped persons. Approved by the Association of Rehabilitation Centers and the National Association of Sheltered Workshops and Homebound Programs, these standards pertain to internal organization of the facilities, personnel, types and quality of services, records and reports, fiscal management, physical plant,

and the efficiency of industrial activities when provided.

The commission will issue certificates and published lists of rehabilitation facilities which are accredited, regularly review and re-evaluate standards, revise standards upward in conformity with changing professional skills, and cooperate with other organizations which have similar goals. Facility survey and accreditation activities will begin in 1967.

Trustees chosen for 3-year terms are Dr. Howard G. Lytle, executive secretary, Indianapolis (Ind.) Goodwill Industries, Inc.; E. J. Desjardins, manager, G. F. Strong Rehabilitation Centre, Vancouver, B.C.; and Dr. William Erdman II, professor and chairman, department of physical medicine and rehabilitation, Medical College of the University of Pennsylvania, Philadelphia.

Dr. Jack G. Haldeman, president, Hospital Review and Planning Council of Southern New York, New York City; J. Arthur Johnson, executive director, Columbia Lighthouse for the Blind, Washington, D.C.; and Leo Perlis, director, community services department, AFL-CIO, also in Washington, were appointed for 2-year terms.

Dr. Gerald H. Fisher, administrator, Hot Springs (Ark.) Rehabilitation Center; Michael M. Galazan, executive director, Jewish Vocational Service, Milwaukee, Wis.; and Dr. Dorothy Cantrell Perkins, supervisor, field relations, rehabilitation counseling program, California State College at Los Angeles will serve for 1 year.

Dr. Lytle has been elected chairman of the commission and Desjardins, vice chairman. Dr. Perkins has been elected secretary-treasurer.

CHROMATOGRAPHIC IDENTIFICATION OF BACTERIA

In an investigation of pure strains of bacteria, scientists at the General Electric Electronics Laboratory at Syracuse and Cornell University at Ithaca found that the pattern of metabolic products of each of the 32 strains examined is distinct, thus providing an identifying fingerprint. The investigation was undertaken for the U.S. Air Force Office of Scientific Research.

The fingerprinting technique allows further opportunity to study the basic life processes of micro-organisms as well as the organisms believed responsible for certain diseases. It will also reduce considerably the time required to analyze samples of clinical and environmental specimens. Conceivably, future applications of the technique will be coupled with an advanced

information system to permit automatic identification of the micro-organism under study.

Using a gas-liquid chromatography technique, the scientists were able to distinguish not only one species of bacteria from another in the test group of micro-organisms, but one strain from another within a species.

The metabolic products released by the micro-organisms were measured and a unique mixture of metabolic products was observed for each strain studied. The approach was to analyze the metabolic products of the bacteria by measuring the molecules that are excreted in the life process.

A standard laboratory chromatograph is used to separate and to analyze the metabolic prod-

Figure 1. Detection and identification of a micro-organism, using its metabolic products to provide a chromatogram

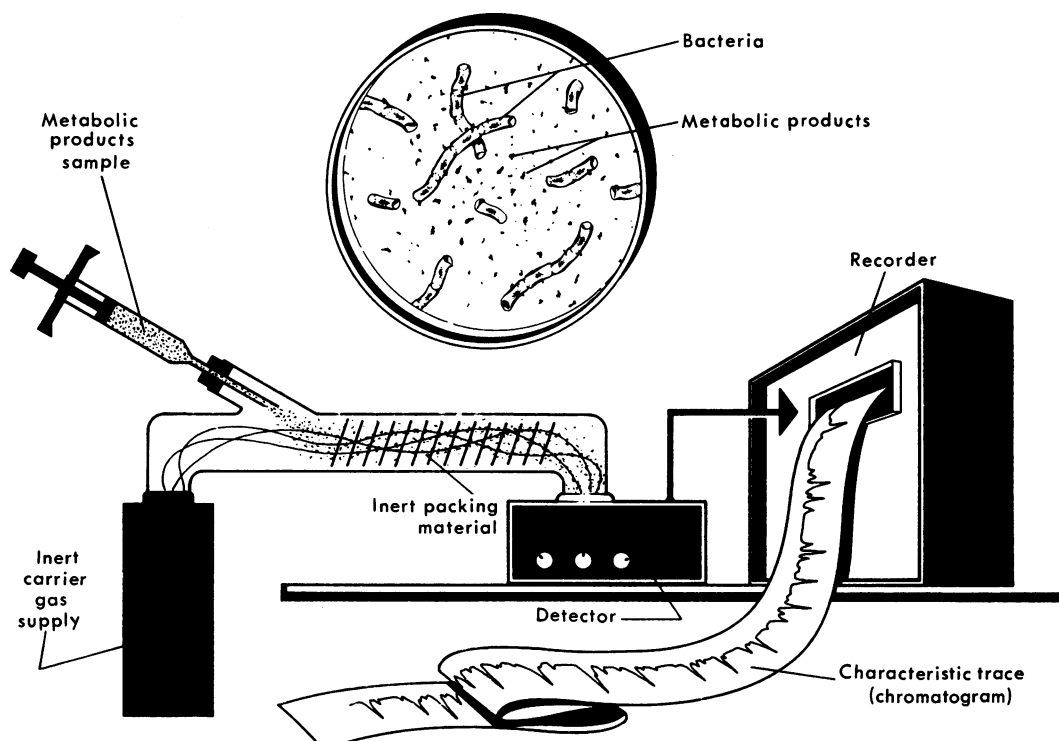
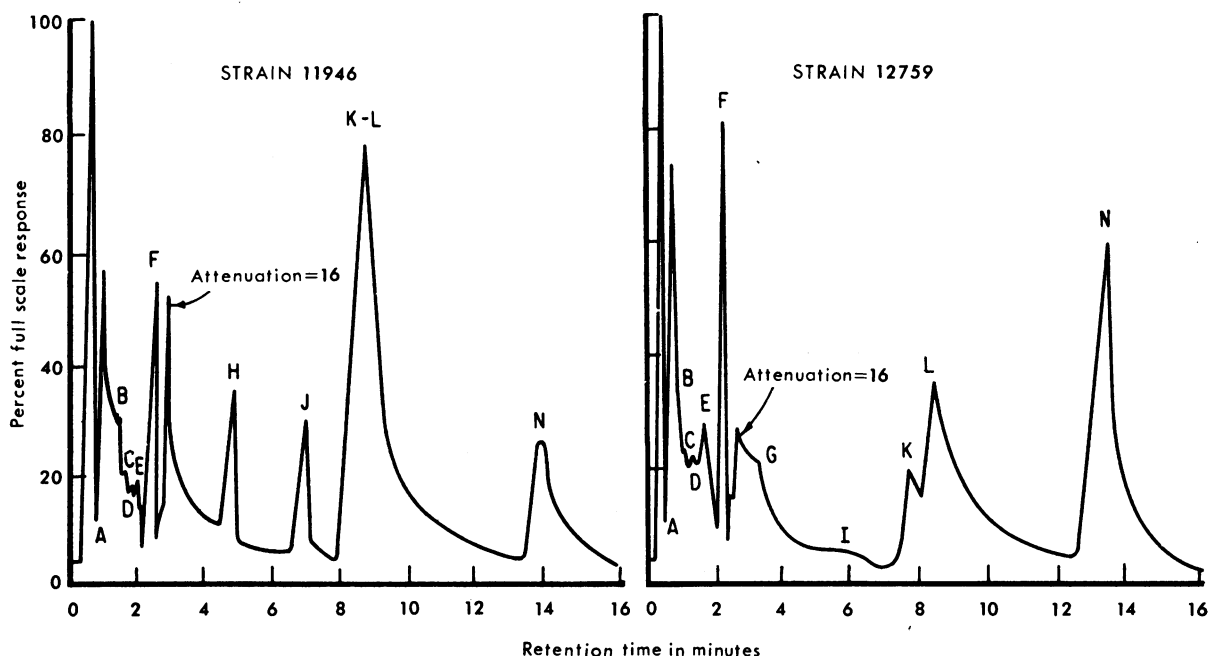


Figure 2. Chromatograms of two strains of *Bacillus licheniformis*



ucts (fig. 1). The volatile products yielded by a sample of bacteria are collected, processed, and injected into the device. Each product requires a different time to pass through the column in the chromatograph. When each product reaches the end of the column, it is sensed by highly sensitive detectors, and the results are displayed graphically as a chromatogram (fig. 2).

The signature is determined by a letter assigned to each product and listed in order of decreasing quantity. The distinction in the signatures among the strains is based on the variations in quantity of the same products and the presence or absence of products.

Distinct signatures were obtained for the 32 samples, which included 29 strains of *Bacillus* and individual strains of *Escherichia coli*, *Aerobacter aerogenes*, and *Pseudomonas aeruginosa*.

A number of intestinal pathogens, including strains of *Salmonella* and *Vibrio*, were also investigated.

The method seems to detect the presence of smaller numbers of micro-organisms than other known procedures, and identifies closely related types. The detection devices used at the output of the chromatograph are sensitive to less than 1 part per billion of certain organic molecules. Detection and identification that now take days or weeks by classic methods could be done in hours. Military, clinical, and space researchers as well as public health agencies may be able to apply this technique to their specific needs. Eventual application of the technique to highly automated medical diagnostic equipment, hospital monitoring equipment, and water and air pollution monitoring equipment is expected.

Federal Publications

Domestic Agricultural Migrants in the United States. *PHS Publication No. 540; revised 1966.* Developed for persons working with migrants and their problems. Provides a large map of the United States which indicates the counties into which an estimated 100 or more seasonal agricultural workers and their families migrated during the peak season of 1965. Presents in tabular form, the 668 counties, in four categories: 100 to 500 migrants, 500 to 3,000, 3,000 to 10,000, and 10,000 or more.

Proceedings, 1965 Northwest Shellfish Sanitation Research Planning Conference. *PHS Publication No. 999-FP-6; 1966; 112 pages.* Presents text of discussions at the annual Northwest Shellfish Conference which aids the laboratory. Proceedings show significant changes in physical facility and direction of research.

Cancer of the Mouth. *PHS Publication No. 1461, Health Information Series No. 132; 1966; 6 pages; 5 cents, \$2.75 per 100.* Discusses symptoms, causes, treatment, and research in cancer of the mouth. Warns that a doctor should be seen if a problem persists for 2 weeks because oral cancer progresses rapidly.

Soil and Sediment Analysis: Preparation of samples for environmental radiation surveillance. *PHS Publication No. 999-RH-19; 1966; by John H. Abrahams, Jr., and Raymond H. Johnson, Jr.; 25 pages.* Describes techniques for separating soil samples into different size fractions. Ultrasonic vibrations and high-speed stirring were evaluated as methods of achieving the dispersion of soil particulates prior to screening for radioanalysis of the fractions. Ultrasound proved a more suitable method for achieving rapid dispersion. When the gamma-emitter zinc

65 was used as a tracer, it was found that 54 percent of the activity was associated with particles smaller than 43 microns in diameter. A corresponding fraction, after stirring, contained only 32 percent of the activity. Analysis of sediments before and after dispersion indicated that ultrasonic treatment released silt particles bound together by organic matter.

Mortality of New England Dentists, 1921-1960. *PHS Publication No. 999-RH-18; 1966; by Robert L. Glass; 70 pages.* Reports the findings of an epidemiologic study conducted to determine the mortality of a population of dentists as compared with the general population and physicians. Gives age, date of entry to risk, and survivorship status of dentists and computes age-distributed person-years at risk. Compares observed numbers of deaths from all causes and from selected causes with those expected according to various standard death rates. Describes, in detail, the study design and statistical treatment of the findings. No relationship between mortality and exposure to ionizing radiation was observed.

Health Statistics From the U.S. National Health Survey. National Center for Health Statistics.

INTERVIEW RESPONSE ON HEALTH INSURANCE COMPARED WITH INSURANCE RECORDS, United States, 1960. *PHS Publication No. 1000, Series 2, No. 18; August 1966; 43 pages; 35 cents.*

REPORT OF THE INTERNATIONAL CONFERENCE ON THE PERINATAL AND INFANT MORTALITY PROBLEM OF THE UNITED STATES. *PHS Publication No. 1000, Series 4, No. 3; June 1966; 21 pages; 25 cents.*

REPORT OF THE FIFTEENTH ANNIVERSARY CONFERENCE OF THE UNITED STATES NATIONAL COMMITTEE ON VITAL AND HEALTH STATISTICS. *PHS*

Publication No. 1000, Series 4, No. 4; June 1966; 26 pages.

HISTORY OF THE UNITED STATES NATIONAL COMMITTEE ON VITAL AND HEALTH STATISTICS, 1949-1964. *PHS Publication No. 1000, Series 4, No. 5; June 1966; 42 pages.*

HOSPITAL DISCHARGES AND LENGTH OF STAY: Short-stay hospitals, United States, July 1963-June 1964. *PHS Publication No. 1000, Series 10, No. 30; June 1966; 66 pages; 45 cents.*

AGE PATTERNS IN MEDICAL CARE, ILLNESS, AND DISABILITY, United States, July 1963-June 1965. *PHS Publication No. 1000, Series 10, No. 32; June 1966; 84 pages; 55 cents.*

WEIGHT BY HEIGHT AND AGE OF ADULTS, United States, 1960-1962. *PHS Publication No. 1000, Series 11, No. 14; May 1966; 38 pages; 35 cents.*

PRESENCE OF OSTEOARTHRITIS IN ADULTS, by age, sex, race, and geographic area, United States, 1960-1962. *PHS Publication No. 1000, Series 11, No. 15; June 1966; 27 pages; 25 cents.*

ORAL HYGIENE IN ADULTS, United States, 1960-1962. *PHS Publication No. 1000, Series 11, No. 16; June 1966; 30 pages; 30 cents.*

SEASONAL VARIATION OF BIRTHS, United States, 1933-63. *PHS Publication No. 1000, Series 21, No. 9; May 1966; 59 pages; 45 cents.*

EPISODES AND DURATION OF HOSPITALIZATION IN THE LAST YEAR OF LIFE, United States, 1961. *PHS Publication No. 1000, Series 22, No. 2; June 1966; 48 pages; 35 cents.*

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington D.C., 20402. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington, D.C. 20201.

The Public Health Service does not supply publications other than its own.

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HALPERIN, JEROME A. (Kansas State Department of Health), and HESLEP, JOHN M.: Radium in military surplus commodities. *Public Health Reports, Vol. 81, December 1966, pp. 1057-1063.*

The problem of military surplus property containing radioactive material that is available to the general public in California was investigated by the California State Department of Public Health. Physical surveys of surplus commodities in retail stores were made using appropriate radiation detection instruments. Many items were identified as containing radioactive material. The radioactive items were luminous dials or components of aircraft panel instruments, electronic equipment, gauges, and meters. The radionuclide of greatest concern was found to be radium 226 in amounts varying from 0.06 to 14.6 micrograms.

A review of the disposal procedures of the Defense Supply Agency, Department of the Army, revealed that surplus commodities containing radioactive materials were available to civilian Federal agencies and authorized groups such as colleges and universities, Boy Scouts of

America, American National Red Cross, and so forth. The disposal procedures were found to contain directives on how potential purchasers are to be informed of the possible radioactive content of certain items, but were not found to contain specific directives for the screening and removal of radioactive items prior to release of the surplus property to non-military users.

Because the amounts of radioactive material found in surplus commodities are high enough to warrant licensure and regulation for protection against radiation and because all unnecessary radiation exposure should be eliminated, it is contended that such items should be removed from surplus property before it is released for public consumption.

The results of the investigation were presented to the Defense Supply Agency. The reactions of that agency are reported.

CHUAQUI, CONSTANTINO (University of Chile), LEMKAU, PAUL V., LEGARRETA, ADELA, and CONTRERAS, M. ANGELICA: Suicide in Santiago, Chile. *Public Health Reports, Vol. 81, December 1966, pp. 1109-1117.*

A study of suicides in Santiago, Chile, during the years 1961-62 and of serious suicide attempts in 1961 revealed a higher suicide rate for men, particularly older men, than women. Male suicide rates increased with age, but for females a peak was reached in early adulthood and the rates decreased in the later years.

Men used violent means of suicide—firearms and hanging—more frequently than women. Women comprised a larger proportion of the persons attempting suicide than of the group who actually committed suicide. This fact may be related to their more frequent use of a less lethal suicide method—poisoning.

The distribution of suicides in Santiago by age, sex, and suicide method resembled that reported for some western

cities of the United States. Within Santiago, rates of suicide differed significantly in different areas. A significant positive correlation was found between suicide rates and population density. Suicide rates also appeared to be related directly to socioeconomic status, for they correlated negatively with infant mortality rates.

Almost 90 percent of the persons in Santiago who attempted suicide were released to their homes from emergency medical centers without sufficient consideration of their psychiatric condition. A closer collaboration of psychiatric specialists with the staffs of such centers would promote better management of persons with suicidal tendencies and other psychiatric abnormalities.

VOORS, A. WOUTER (University of North Carolina School of Public Health): Data storage, retrieval, and reuse in epidemiologic studies. *Public Health Reports, Vol. 81, December 1966, pp. 1092-1094.*

Reuse of epidemiologic data can be an economical and useful step in the scientific process. Reuse can be promoted by the adoption of an inexpensive method of data storage, which includes some redundancy to permit detection of copying errors, and by the use of an existing specialized library service to provide acces-

sibility. In a sample of 30 epidemiologic papers, the data of all but 4 could be recorded on less than 20 sheets of paper, each sheet containing 50 lines of characters, a bulk which remained within the practical limitations inherent in this library service.

SIEVERS, MAURICE, L. (Public Health Service): Disease patterns among southwestern Indians. Public Health Reports, Vol. 81, December 1966, pp. 1075-1083.

Among southwestern Indians, duodenal ulcer is rare, but cholelithiasis is prevalent, accounting for most laparotomies. Diabetes mellitus occurs frequently, especially in tribes whose members tend to be obese. Gastric and biliary cancer are the leading causes of malignancy among southwestern Indians. Breast and lung carcinoma are less frequent than among white people. The infrequency of atherosclerosis may reflect low blood cholesterol levels. Myocardial infarction seldom occurs in these Indians without diabetes, hypertension, or other definite precipitating factors. Hypertension is apparently less frequent than among white persons.

A high rate of tuberculosis persists among southwestern Indians, and this "second great imitator" must always be considered in any obscure illness among them. Coccidioidomycosis occurs only in Indians who reside within, or visit, the area where *Coccidioides immitis* infests the soil. Skeletal fluorosis due to a high fluoride content of drinking water has been noted in Indians in certain south-

western reservation areas and requires recognition but no other diagnostic or therapeutic procedures. For unknown reasons, Indians apparently do not develop primary open-angle glaucoma, but trachoma is a common ocular disease. Since the Rh negative blood type probably does not exist among southwestern Indians, erythroblastosis fetalis due to Rh incompatibility is neither expected nor observed. Alcoholism, dietary deficiency, Laennec's cirrhosis, and bleeding esophageal varices are major health problems of most tribes.

The high rate of traumatic lesions among southwestern Indians may relate to alcoholism, automobile accidents, and the occupational riding of horses. Umbilical hernia has been noted much more often than inguinal hernia. Rheumatoid arthritis is fairly prevalent. Bronchial asthma is infrequent. A significant number of congenital lesions occur, perhaps because of the frequent consanguineous marriages in many southwestern American Indian tribes.

McDONOUGH, E. S. (Marquette University, Milwaukee, Wis.), LEWIS, ANN L., and PENN, L. A.: Relationship of *Cryptococcus neoformans* to pigeons in Milwaukee, Wisconsin. Public Health Reports, Vol. 81, December 1966, pp. 1119-1123.

In a longitudinal study in and around the city of Milwaukee, pigeon excreta and soil containing pigeon droppings were assayed for the presence of animal or human pathogenic fungi. *Cryptococcus neoformans* was isolated by intravenous and intraperitoneal mouse inoculation and by direct culture on laboratory media. The yeast was found to exist in almost

all old nesting places of all sizes examined.

Over a 3-year period, *C. neoformans* was isolated regularly from dried pigeon droppings dislodged by birds from roosting places on a large building and collected as sidewalk sweepings. This was considered indicative of active dispersal of the fungus into the air.

GORWITZ, KURT (Maryland Department of Mental Hygiene), BAHN, ANITA K., KLEE, GERALD, and SOLOMON, MURRAY: Release and return rates for patients in State mental hospitals of Maryland. Public Health Reports, Vol. 81, December 1966, pp. 1095-1108.

A study was made of the patterns of retention, release, and rehospitalization of patients admitted to three Maryland State mental hospitals during the 18-month period July 1, 1961-December 31, 1962. All patients were followed until June 30, 1964—providing an observation period ranging from a minimum of 18 months to a maximum of 36. Selected for inclusion were patients between the ages of 25 and 54 years who were reported with diagnoses of alcoholism, psychoses, psychoneuroses, or personality disorders.

In addition to diagnosis, the following patient characteristics were studied: sex, race, marital status, age, level of education, place of residence, type of admission, and number of previous admissions.

More than half of the patients in each of the three diagnostic cohorts had been released within 3 months of admission and more than 80 percent within 12 months. At the end of 18 months after release, 45 percent of the psychotics, 45 percent of the alcoholics, and 32 percent of the patients with personality disorders had been rehospitalized.